

## Logistics Capacity Study of the Guaymas-Tucson Corridor

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### Introduction

The Port of Guaymas, Sonora is located in the northwest of the Pacific coast of Mexico, 258 miles from the nearest border crossing point in Nogales, Arizona (Figure 1). The Port is situated on the Gulf of California, a region that has not been heavily exploited for maritime commerce. Currently the main shipments coming in and out of the Port are petrochemical products and bulk cargo such as grains and cement. However, the Port is only utilizing 10% of its dock and staging areas.

The lack of tenants at the Port is a primary reason that it is not included on the many maritime routes for containerized cargo between different commercial ports, especially for those between North America and Asia. In turn, the infrastructure required to efficiently load and unload these containerized shipments may not be currently available. In addition, the port's key scheduling operations are done through a charter service. This means vessels only come to the port when there is demand for a shipment (on demand). This situation makes the Port unattractive for commercial shipping lines, and at the same time makes it hard to institute regular container service.



Figure 1. Map of the region

On the other hand, the Port has unused capacity which could allow for fast and efficient vessel turnaround since the port does not experience the congestion of larger, regularly scheduled ports of call. Thus, there is the potential for a smooth flow of inbound and outbound materials through the Port's docks. This ease of flow could be very attractive to shippers located in Sonora, Arizona and other states that have been identified as within the area of influence of the Port of Guaymas. Of particular importance is the notion of using the Port of Guaymas as a relief port for the congested ports of Long Beach and Los Angeles.

Additionally, the Port of Guaymas could be attractive as a site for value added manufacturing to customize merchandise coming from other regions to the North American market and adding Mexican content to merchandise destined for Mexico's free trade partners. However, before exploring these and other opportunities it is necessary to assess the current capacity of the Port of Guaymas.

In its potential role as an alternative port to Long Beach/Los Angeles, Guaymas must be capable of providing reliable, consistent service to and from the United States market. A critical link between Guaymas and the United

States is the Guaymas-Tucson corridor, and the capabilities of that link have to be assured. To accomplish this objective we propose a two-phase study of the corridor. In the first phase, we will perform a quick operational assessment of the current capability of the Guaymas-Tucson corridor. In this phase of the analysis our attention will be on assessing the capacity of the corridor in terms of TEU's the corridor can currently handle. As part of this first phase we will provide preliminary recommendations for future investments, by identifying current and potential bottlenecks of the corridor, the projects required for solving those bottlenecks and the priority of those projects based on the overall benefits for the corridor. In this phase we will also make an inventory and summarize the available relevant studies that have been performed on the corridor. In the second phase we will expand the study to include prescriptive recommendations in terms of logistics practices and security practices for the port, which will allow it to become globally competitive. In this second phase, we will also identify how Guaymas can serve as a strategic point of collaboration between Arizona and Sonora. The benefits of this collaboration might include an increase in the competitiveness of the corridor and attracting higher added value operations to the region.

At the end of the two phases in collaboration with ADOT and API-Guaymas we will prepare a roadmap showing a ten-year plan for the development of the corridor and a final report of all the findings from the study. Something that must be noticed is that the proposed study will be based on a technical analysis based on historical data, previous analysis, current global logistics practices and the current installed capacity. We will attempt to anticipate, as best as we can, some of the effects of infrastructural improvements on capacity, in terms of additional TEU's, through analytical modeling and Montecarlo simulation. However, while we will try to anticipate some of the benefits for the region of the expected increase in capacity we will not pretend to portray this as a valid economic development analysis: this is beyond the scope of the proposed work and we anticipate that a recommendation to undertake such study will be part of the final report. We also expect this project to be a participative effort between the governments of Arizona, Sonora and the Mexican Federal Government. So the close collaboration among these three parties is expected, especially with ADOT through the help of Rudy Perez, the Technical Advisory Committee (TAC) of the Transportation Committee of the Arizona-Mexico Commission and the Secretaria de Comunicaciones y Transportes (SCT) in Mexico through the General Directorate of Ports.

### **Description of the First Phase of the study**

The main objective of this phase consists of getting a valid, quantitative assessment of the capacity, in terms of TEU's, of the Guaymas-Tucson Corridor. The determination of the capacity of the corridor is essential. No major initiative can be started until it is certain that the connecting corridor can handle the increase in traffic generated in connection with Guaymas becoming a regularly scheduled port of call. As part of the study we will examine the expected transit times of a container from the time the ship arrives to the port, to the time the container is placed on a major US transportation link (either rail or highway). We anticipate that the main focus of the study will be on the rail link between Guaymas and Tucson, but road capacity and Nogales crossing congestion will also be considered.

The general steps in the first phase of the study are as follows:

1. Identification, assessment and classification of previous studies dealing with the Corridor
2. Refinement of tasks to be performed in Phase I
3. Documentation of current conditions of the Port of Guaymas
4. Identification of the major links and nodes of the transportation network between the Port of Guaymas and Tucson
5. Documentation of the capacity of each of the nodes
6. Determination of baseline cargo scenario
7. Determination of expected transit times between Guaymas and Tucson
8. Bottlenecks identification and potential improvements
9. Preparation of scope of work for Phase II
10. Preparation of report of Phase I

Each one of these activities is briefly described next.

### **Identification, assessment and classification of previous studies dealing with the Corridor**

As part of the first phase of the study we will perform a comprehensive review of all the different studies that have been previously performed dealing with the Guaymas-Tucson Corridor. The motivation of this review is twofold: to serve as a starting point for the capacity study, and to assess, summarize, dissect and organize the body of knowledge already available.

We now present a preliminary list of the studies to consolidate, but we should mention that is not exhaustive list and more studies could be added later:

- ADOT's library of corridor profile studies, rail studies and other transportation plans, such as I-19 corridor study, Cyber Port project and Arizona Rail Plan.
- Guaymas' Master Development Plan
- I-10 National Freight Corridor Study
- Canamex Corridor Study
- Instituto Mexicano del Transporte studies
- U.S. Trade and Development Agency (USTDA) Guaymas Study 2003
- Statistics from the Secretaria de Comunicaciones y Transportes (SCT)
- Arizona's Global Gateway: Addressing the Priorities of Our Border Communities
- Impacts of Transportation and Education on Trade and Development in the Arizona-Sonora Region
- Arizona Trade Corridor Study
- Other regional, state and local studies and developments plans for Arizona and Mexico

### **Refinement of tasks to be performed in Phase I**

The tasks that are listed in this document for Phase I are based on the information currently available to us. Once a preliminary assessment of previous studies and other sources of information are available we are planning to revisit these tasks and prepare a refined plan of action for Phase I. Before this modified plan is implemented we will seek feedback from the Technical Advisory Committee through Rudy Perez. We anticipate that this revised plan will be available by August 15.

### **Documentation of current conditions of the Port of Guaymas**

Since the Port of Guaymas is the most critical link in the Guaymas-Tucson Corridor we will an initial assessment of its current capabilities from the perspectives of existing infrastructure, services offered and installed capacity. We will use, as much as we possible can, existing reports such as the master plan for the Port of Guaymas.

### **Identification of the major links and nodes of the transportation network between the Port of Guaymas and Tucson**

Once we gather all the information related to the area of study we will document the transportation network. This network will include the rail and highway network and the main multimodal facilities. We demonstrate this network approach with an example from BNSF rail structure in Northern Arizona (Figure 2).

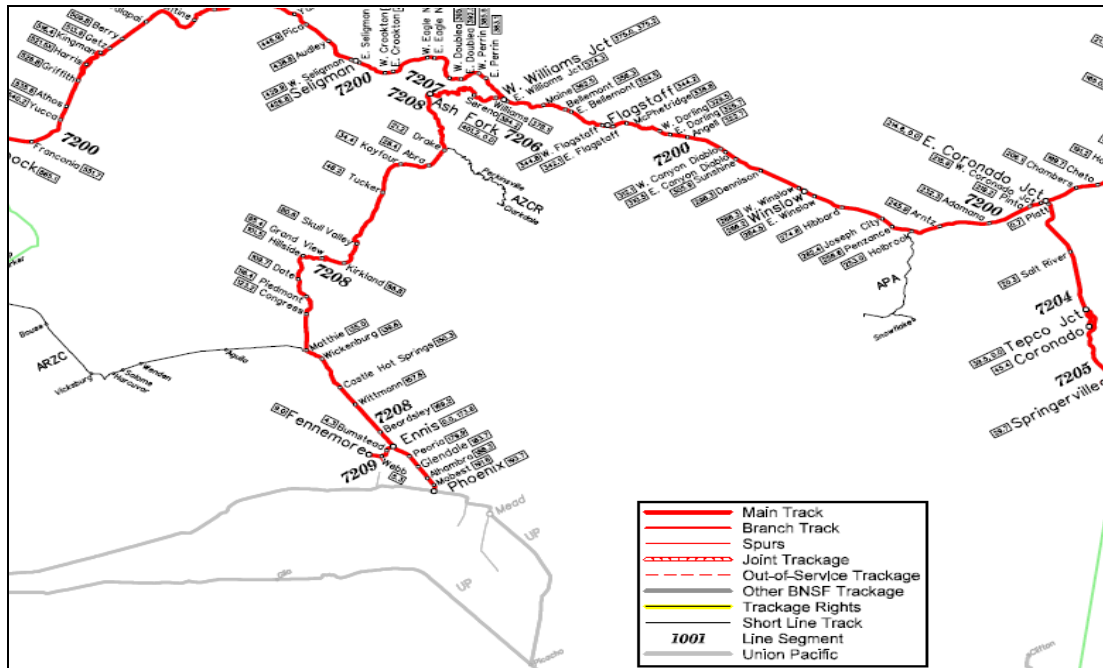


Figure 2. BNSF rail network in Northern Arizona

For this part of the study we expect to rely heavily on GIS tools and databases that will allow us to store and visualize the infrastructure in Sonora and Mexico. We expect to consult the North American Geographical database NORTAD from DOT, the information provided by ADOT, ASU's GPSI and SIGET Database from IMT in Mexico.

Once we have the design and capacity of the transportation network, we can use this information to develop mathematical models useful for modeling the total capacity of the system and its performance. There are several models that can be used to model the capacity and the performance of transportation networks. We are planning to use a network approach similar to the shortest path or the maximal flow problems, Depicted in Figure 3.

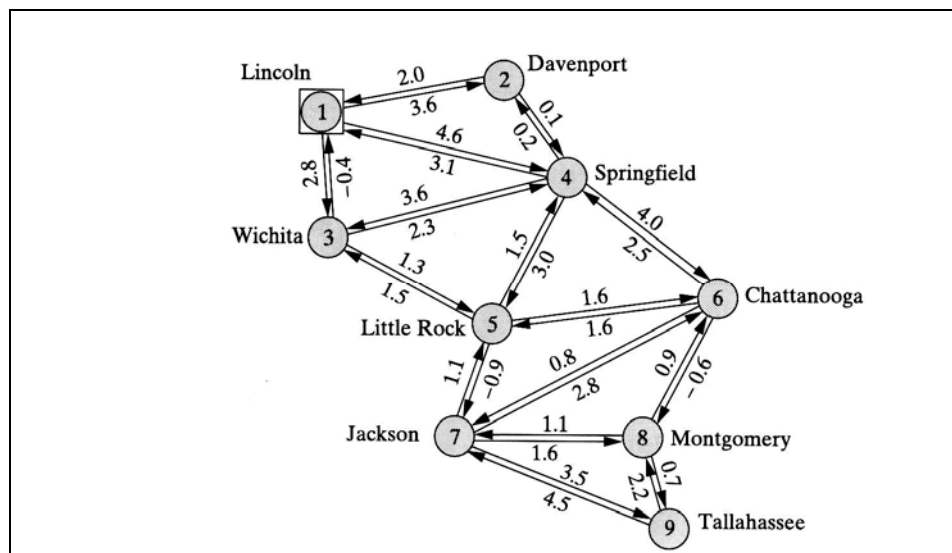


Figure 3. Shortest path network

### **Documentation of the capacity of each of the nodes**

By working with state and federal agencies, railroads, customs brokers and other relevant players we will investigate and document the capacity of each of the links and nodes identified. This will be done, as much as possible, from currently available reports already completed by governmental/ transportation agencies and their subcontractors. For those cases in which information is either not available or is deemed not reliable analytical or simulation studies will be performed

The information that we will use in this part of the study will be obtained from the following sources:

- Use data from Highway Performance Monitoring System
- Data from Freight Analytical Framework
- Instituto Mexicano del Transporte
- Secretaria de Comunicaciones y Transportes

### **Determination of baseline cargo scenario**

By working with the Port of Guaymas we will establish a most likely cargo scenario for the beginning of container operations of the corridor. In particular, we will agree upon a minimum number of containers needed to establish Guaymas as a terminal in a regular shipping schedule; and this minimum will be the baseline for the initial capacity study.

### **Determination of expected transit times between Guaymas and Tucson**

Based on the previous information we will determine the time that it will take for cargo to travel from the Port of Guaymas to Tucson, by using the following means

1. Double stacked, dedicated trains, from Guaymas to Tucson
2. Double stacked, regularly scheduled, trains from Guaymas to Tucson
3. Single stacked, regularly scheduled, trains from Guaymas to Tucson, double stacking the containers in Tucson or Nogales
4. Using trucks to move the containers from Guaymas to Nogales or Tucson

### **Bottlenecks identification**

Once we determine the flow information for the baseline cargo, we will perform a sensitivity analysis of the study by increasing the container carrying capacity of the corridor until we have identified the most important bottlenecks. In this part of the study we are planning to make a preliminary estimation of the impact that potential improvement to the current infrastructure in the bottleneck(s) will have on the overall capacity of the corridor. We anticipate that the current crane capacity in the Port of Guaymas and the throughput capacity of the Nogales Port of Entry will be two of the points analyzed. We also anticipate that the tools we use to make this analysis will include the use of Montecarlo Simulation and analytical logistics models.

### **Preparation of scope of work for Phase II**

Based on the findings of Phase I, a scope of work for Phase II of the study will be prepared.

### **Interim report and Phase II scope of work preparation**

A report documenting the findings of Phase I of the study will be prepared. Given the binational nature of the present study we will provide two separate documents for each one of the reports one in Spanish and the other one in English

### **Requested Budget for first phase**

The first phase of the study is assumed to be performed from July 15 to December 31, 2005. The main items in the budget include, salary for two graduate students, salary for two undergraduate students for the duration of the project, one month of summer salary for J. Rene Villalobos, half month of summer salary for Arnold Maltz, and funds for travel. A separate budget from the ASU's Office of Research and Sponsored Project is attached to this document.